

## Script generated by TTT

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Web Services

Web services provide a standard means of communication among distributed software applications based on the Web technology. Standardization by the W3C community.

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Simple Object Access Protocol (SOAP)

simple and lightweight XML-based mechanism for exchanging data between network applications. **SOAP** is a de-facto standard for XML messaging:

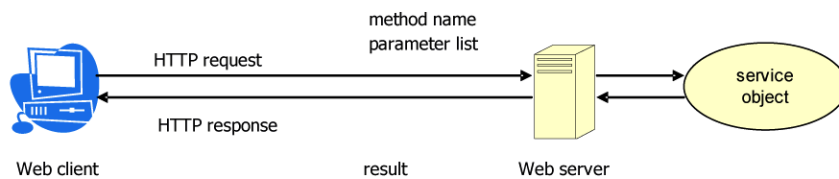
relatively simple.

flexible and extensible.

based on XML.

not bound to a specific protocol; use of Internet protocols such as HTTP, SMTP

may be used for RPC or document transfer.



use of SOAP for sending Web Services messages

[Parts of SOAP](#)

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Parts of SOAP

SOAP consists of three parts:

an envelope.

a set of encoding rules.

a convention for representing remote procedure calls and responses.

[SOAP Message](#)

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one-way transmissions from a sender to a receiver.

combination of SOAP messages to implement interaction patterns such as request/response.

A SOAP application receiving a SOAP message must process the message by performing the following actions

1. Identify all parts of the SOAP message intended for that application; interpret the "SOAP actor" attribute of the SOAP header.
2. Verify that all mandatory parts are supported by the application for this message and process them accordingly.
3. If the SOAP application is not the ultimate destination of the message then remove all parts identified in step 1 before forwarding the message.

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SOAP naturally follows the HTTP request/response message model providing SOAP request parameters in a HTTP request and SOAP response parameters in a HTTP response.

use of media type "text/xml".

[SOAP Message Embedded in HTTP Request](#)

[SOAP Message Embedded in HTTP Response](#)

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```
POST /StockQuote HTTP/1.1
Host: www.stockquoteserver.com
Content-Type: text/xml; charset="utf-8"
Content-Length: nnnn
SOAPAction: "Some-URI"

<SOAP-ENV:Envelope
  xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
  SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/">
  <SOAP-ENV:Body>
    <m:GetLastTradePrice xmlns:m="Some-URI">
      <symbol>DIS</symbol>
    </m:GetLastTradePrice>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

SOAP request: processed by a servlet, CGI or standalone daemon running on a remote web server.

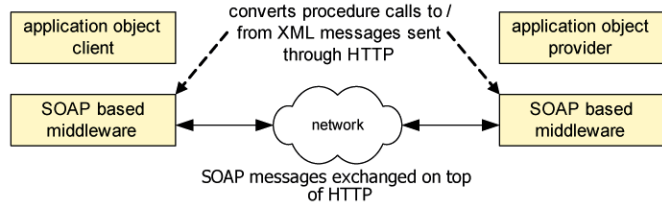
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```
HTTP/1.1 200 OK
Content-Type: text/xml; charset="utf-8"
Content-Length: nnnn

<SOAP-ENV:Envelope
  xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
  SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/">
  <SOAP-ENV:Body>
    <m:GetLastTradePriceResponse xmlns:m="Some-URI">
      <Price>33,2</Price>
    </m:GetLastTradePriceResponse>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

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RPC interactions may be mapped to SOAP.



Example

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Java Method

```
public int addFive(int arg);
```

Request Message in SOAP

```
<env:Envelope>
  <env:Body>
    <myNS:addFive xmlns:myNS="http://my-domain.de/"
      enc:encodingStyle="http://">
      <arg xsi:type="xsd:int">33</arg>
    </myNS:addFive>
  </env:Body>
</env:Envelope>
```

Response Message in SOAP

```
<env:Envelope>
  <env:Body>
    <myNS:addFiveResponse xmlns:myNS="http://my-domain.de/"
      xmlns:rpc="http://www.w3.org/2003/05/soap-rpc"
      enc:encodingStyle="http://">
      <rpc:result>ret</rpc:result>
      <ret xsi:type="xsd:int">38</ret>
    </myNS:addFiveResponse>
  </env:Body>
</env:Envelope>
```

Example

```
<env:Body>
  <myNS:addFive xmlns:myNS="http://my-domain.de/"
    enc:encodingStyle="http://">
    <arg xsi:type="xsd:int">33</arg>
  </myNS:addFive>
</env:Body>
</env:Envelope>
```

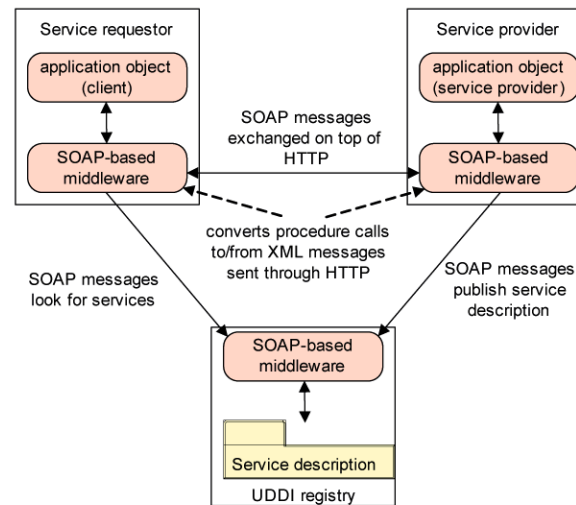
*SOAP namespace*  
*appl. specific namespace*  
*arg. of type int*

Response Message in SOAP

```
<env:Envelope>
  <env:Body>
    <myNS:addFiveResponse xmlns:myNS="http://my-domain.de/"
      xmlns:rpc="http://www.w3.org/2003/05/soap-rpc"
      enc:encodingStyle="http://">
      <rpc:result>ret</rpc:result>
      <ret xsi:type="xsd:int">38</ret>
    </myNS:addFiveResponse>
  </env:Body>
</env:Envelope>
```

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Minimalist Infrastructure for Web Services

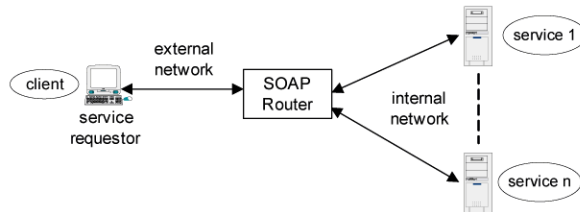


1. providers advertise their services in a UDDI registry
2. clients look for services in a UDDI registry
  - statically: at development time
  - dynamically: at run-time



Routing is a process of delivering messages through a series of nodes or intermediaries, called **SOAP-Routers** in the context of SOAP.

The SOAP Router is the entity that moves SOAP messages between internal and external networks.



Besides routing capabilities the SOAP-Router may provide value-added services such as logging, auditing and enforcement of security policies.

WS\_Routing is a protocol that defines how SOAP messages can be delivered using various transports.

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Web Services - Characteristics

Web Services Architecture

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Ian Forster states: "Web service have little value if others cannot discover, access, and make sense of them."

**Definition:** A **WSDL** document defines **services** as collections of network endpoints, or ports.

WSDL has a purpose similar to that of IDLs in conventional middleware platforms. A WSDL description describes 3 fundamental properties of a Web Service

**What** a service does: operations and the arguments needed to invoke them.

**How** a service is accessed: details of data formats and protocols.

**Where** a service is located: details of the protocol-specific network address, such as a URI.

WSDL Information Model

Example for SOAP Request/Response

Generating code from WSDL

Common bad Practices

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A WSDL document uses the following elements in the definition of network services:

Types: a container for non-built-in data type definitions using some type system, e.g. arrays and structures.

Message: an abstract, typed definition of the data being transferred between the requestor and service;  
method call (request/response): modeled as 2 messages.

Port Type: an abstract set of operations supported by one or more endpoints; an operation specifies a specific input/output message sequence.

Operation: an abstract description of an action supported by the service.

Binding: specifies a concrete protocol and data format for the operations and messages defined by a particular PortType, such as SOAP or Corba.

Port: a single endpoint defined as a combination of a binding and a network address.

Service: a collection of related endpoints.

Parts of WSDL

Relationship of parts

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